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PROJECT BOOKLETMAT2038 Applied Mathematics 20
Module 3**FOR STUDENT USE ONLY**

Date Assignment Submitted:

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Student File Number:

Module Number:

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Assigned

Teacher:

Assignment

Grading:

Graded by:

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**Student's Questions
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Teacher

INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING PROJECT BOOKLET

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- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

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Applied

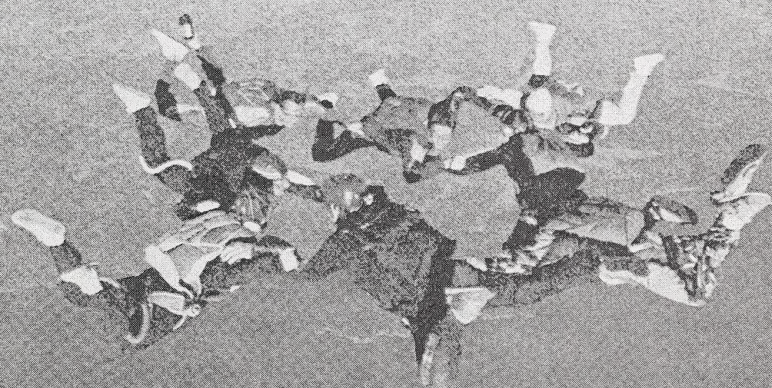
Module

3

Mathematics 20

LINEAR SYSTEMS

PROJECT BOOKLET



Learning
Technologies
Branch

Alberta
LEARNING

FOR TEACHER'S USE ONLY

Summary

Total Possible Marks	Your Mark
40	

Teacher's Comments

Applied Mathematics 20
Module 3: Linear Systems
Project Booklet
Learning Technologies Branch
ISBN 0-7741-1982-9

Title page: PhotoDisc, Inc.

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Students	✓
Teachers	✓
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- Alberta Learning, <http://www.learning.gov.ab.ca>
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PROJECT BOOKLET

APPLIED MATHEMATICS 20: MODULE 3

Your mark for this module will be determined by how well you do on the module project in this Project Booklet and the module assignment in the Assignment Booklet.

The value of each part of the module project is stated in the left margin of this booklet. The total value of the module project is 40 marks.

Read all parts of this booklet carefully and record your answers in the appropriate place. Work slowly and carefully. If you are having difficulties, go back and review the appropriate activity in the Student Module Booklet.

Be sure to complete all parts of the project and proofread your responses before submitting this project to your teacher. If you require more room for any response, use your own paper and attach it securely to this booklet.

40

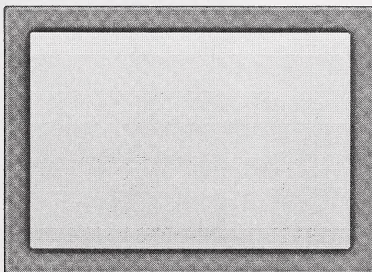
Module Project: Skydiving

Your project for Module 3: Linear Systems is Skydiving. This project involves modelling a skydive in the dive position and in the spread stable position using linear equations and graphs. You will then investigate the nature of the descent during the skydive by creating a table of data and graphing the data.

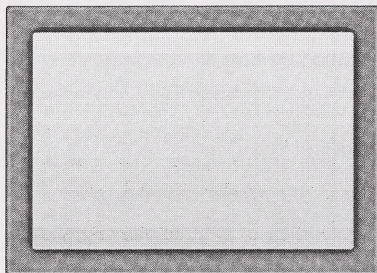
1. Turn to pages 140 and 141 of the textbook and answer exercises 1 and 2 of “Deploying a Parachute” for a skydiver in the dive position. Assume a terminal velocity of 80 m/s. Also, whenever you are given a blank calculator screen, sketch what appears on your display.

1

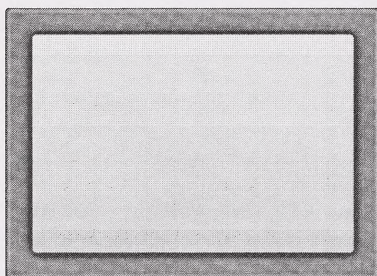
Textbook exercise 1.a.: _____



①

Textbook exercise 1.b.:

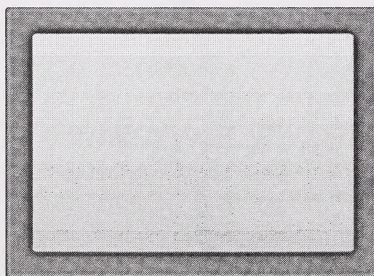
①

Textbook exercise 1.c.:

①

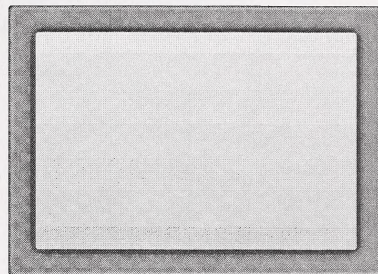
Textbook exercise 1.d.: _____

①

Textbook exercise 2.a.: _____

②

Textbook exercise 2.c.:

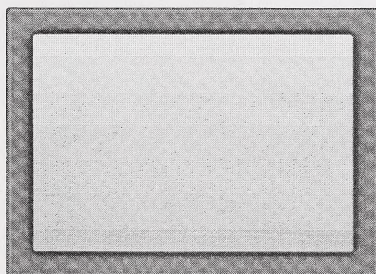


①

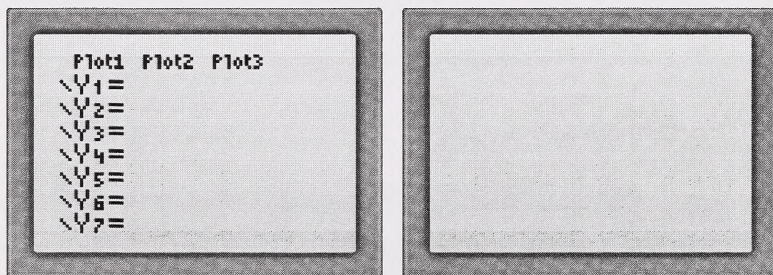
Textbook exercise 2.d.: _____

①

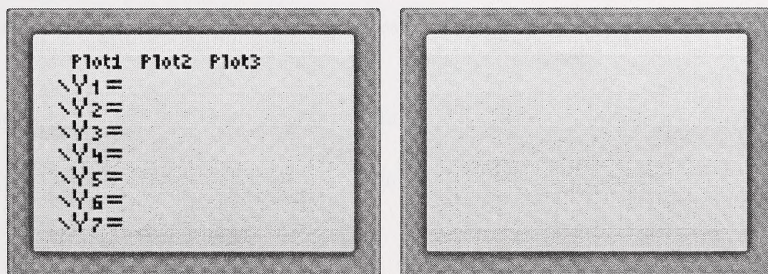
Textbook exercise 2.e.:



- ③ 2. Turn to page 158 of the textbook and answer exercise 1 of “Skydiving to Terminal Velocity.” Remember to reset your window to the appropriate settings. Sketch what appears on your display in the blank calculator screens provided.



- ⑤ 3. Turn to page 158 of the textbook and answer exercise 2 of “Skydiving to Terminal Velocity.” You may need to review Utility 18 on pages 411 and 412 of the textbook. Sketch what appears on your display in the blank calculator screens provided.



4. Turn to page 159 of the textbook and refer to exercise 3 of “Skydiving to Terminal Velocity.”

Analyse how a skydiver drops from an airplane and lands on the ground, and represent your analysis graphically. **Note:** You may use a spreadsheet to complete exercises 4.a. to 4.d.

7

- a. Prepare a table of values with time as the independent variable (in one column) and height as the dependent variable (in the next column) for a jump in the dive position. Your table of values should include the following:

- an initial height (one that you choose)

The height should be more than 3000 m but not exceeding 4000 m. Also, avoid using 3600 m. This way your analysis will be different from the student’s work displayed in the textbook. Note that your chosen initial height corresponds to the height when $t = 0$.

- the height at each second of the jump until terminal velocity is reached

Indicate the terminal velocity for the jump.

- the precise time and height at which the jumper first reaches terminal velocity
- the time and height for every 3 s (or shorter) of the jump at terminal velocity

End this stage at a whole number of seconds for ease of graphing and further calculations.

- the time and height for every 20 s (or shorter) of the jump with the parachute open

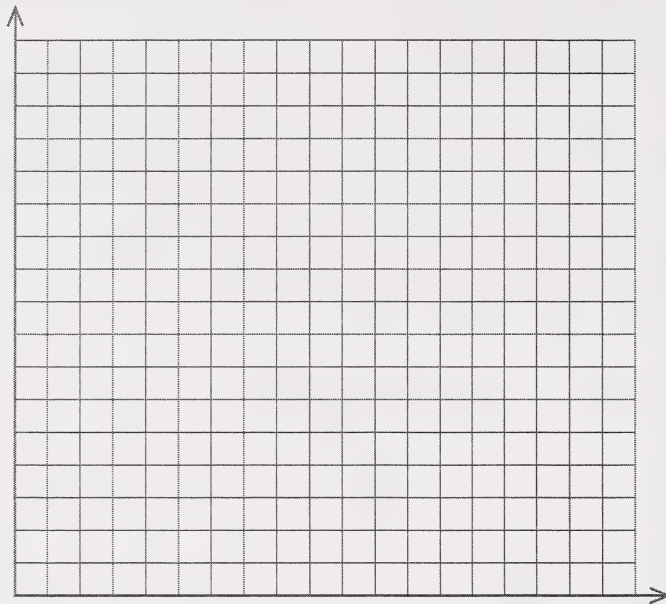
Make sure you have the parachute open in time—well above the minimum safe height.

- the precise time (and corresponding height) when the jumper reaches the ground

Identify the parts of the table corresponding to each of the three stages of the jump.

(There is more room given on the next page.)

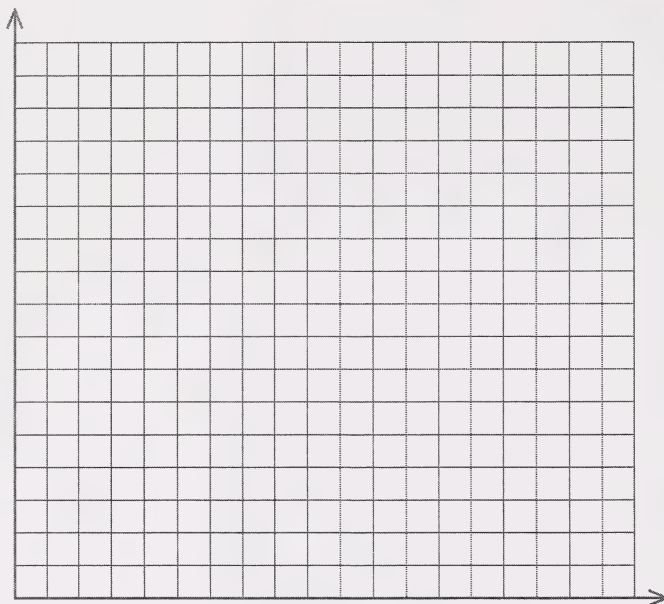
- ②
- b. Make a graph of the data in exercise 4.a., showing how height changes with respect to time for a jump in the dive position. Identify the parts of the graph corresponding to the three stages of the jump.



⑦

- c. Prepare a table of values with time as the independent variable and height as the dependent variable for a jump involving a spread stable position. (Refer to exercise 4.a. Use the same initial height and a similar method to generate the data.)

- ② d. Make a graph of the data in exercise 4.c., showing how height changes with respect to time for a jump in the spread stable position. Identify the parts of the graph corresponding to the three stages of the jump.



- ② e. State and compare the total times in the air for the dive position and for the spread stable position.

③

5. Show illustrations or photographs of skydivers in the dive position, the spread stable position, and the open parachute stage of a jump.

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ASSIGNMENT BOOKLET

MAT2038 Applied Mathematics 20
Module 3

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Date Assignment Submitted:

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Student File Number:

Module Number: _____

FOR OFFICE USE ONLY

Assigned

Teacher: _____

Assignment

Grading: _____

Graded by: _____

Date Assignment Received: _____

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Teacher's Comments

Teacher

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Module

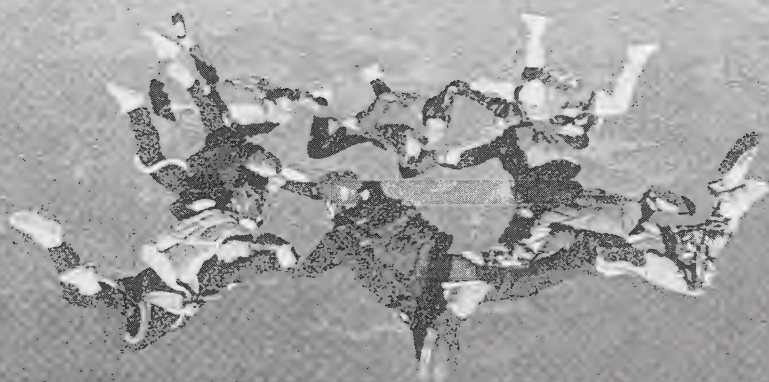
3

Applied

Mathematics 20

LINEAR SYSTEMS

ASSIGNMENT BOOKLET



Learning
Technologies
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LEARNING

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Summary

Total Possible Marks	Your Mark
60	

Teacher's Comments

Applied Mathematics 20
Module 3: Linear Systems
Assignment Booklet
Learning Technologies Branch
ISBN 0-7741-1981-0

Title page: PhotoDisc, Inc.

This document is intended for

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Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	



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60

Module Assignment

3

1. Determine whether $(60, 95)$ satisfies the following system. Show your work.

$$y = \frac{2}{3}x + 55 \quad \textcircled{1}$$

$$y = \frac{4}{3}x + 15 \quad \textcircled{2}$$

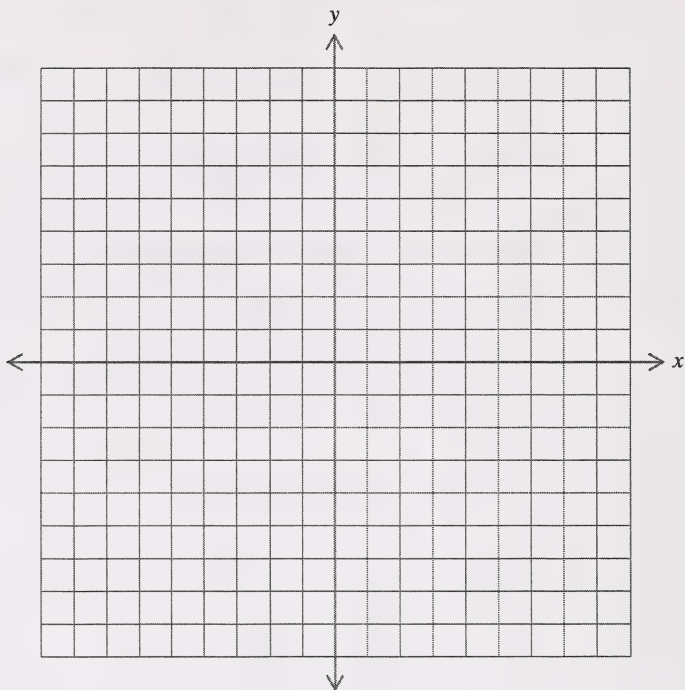
- ④ 2. Solve the following system of equations graphically. Check your solution.

$$y = 3x + 8$$

①

$$y = -x + 4$$

②

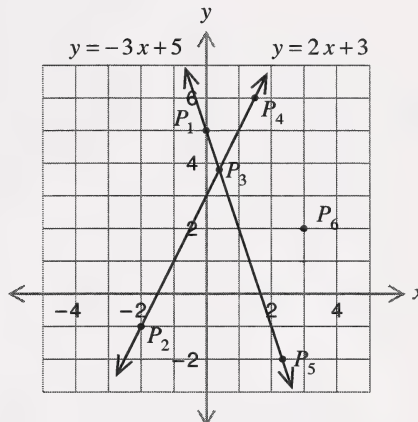


- ② 3. Give any linear system of two equations that has a solution of $(3, 5)$.

4. Refer to the graph of the system of equations given.

$$y = 2x + 3 \quad \textcircled{1}$$

$$y = -3x + 5 \quad \textcircled{2}$$



- a. Which of the identified points satisfies equation $\textcircled{1}$?

- b. Which of the identified points does not satisfy the system nor either equation?

- c. Which of the identified points satisfies the system of equations?

5. Aladdin and Mo went skydiving. Each went up with a different airplane. Even though Aladdin jumped after Mo, both reached terminal velocity at the same time. However, Aladdin reached a terminal velocity of 65 m/s at 3000 m and Mo reached a terminal velocity of 50 m/s at 2610 m. Their height above ground as they continue at terminal velocity is indicated by the following system of equations, where h is the height (in metres) above ground and t is the elapsed time (in seconds) since reaching terminal velocity.

$$h = -65t + 3000 \quad \textcircled{1} \quad \leftarrow \text{Aladdin}$$

$$h = -50t + 2610 \quad \textcircled{2} \quad \leftarrow \text{Mo}$$

- a. Graph the system of equations on your graphing calculator. Sketch your graph, labelling the axes and indicating the scale.

① b. Determine the point that satisfies the system of equations.

② c. Check that the point you found satisfies the system of equations.

① d. How much time elapsed before Aladdin and Mo both reached the same height?

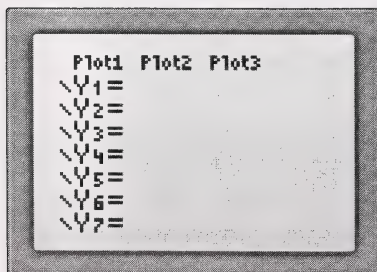
① e. At what altitude did Aladdin and Mo both reach the same height?

6. The following system is to be solved graphically:

$$\frac{2}{3}x - \frac{1}{2}y = \frac{3}{2} \quad \text{①}$$

$$\frac{3}{4}x + \frac{3}{2}y = 12 \quad \text{②}$$

② a. When using a graphing calculator, indicate the equations you must enter into the equation editor. Fill in the blank calculator display.



- ② **b.** Sketch the graphs of the equations of the system, indicating the scale on the axes.

- ① **c.** Identify the intersection point.
-

- ② **d.** Check that the intersection point you identified satisfies the original system of equations.

4

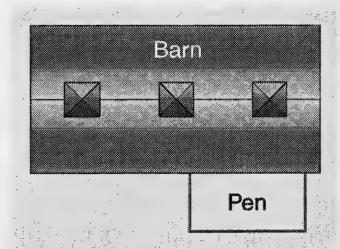
7. Rebecca invested \$3000 of the money she made from her summer job. Rebecca invested part of it at her bank at a rate of 4% per annum. She then invested the rest at a new bank at a rate of 7% per annum. At the end of the year, Rebecca earned a total of \$174 in interest on her savings.

Write a system of equations in two variables that would allow you to determine the amount invested at each bank. Indicate what each variable of the system represents.

3

8. Darren enclosed a rectangular pen against a barn. He used 80 m of electric fencing for three sides and left the side next to the barn unfenced. Darren made the length twice as long as the width.

Write a system of equations in two variables that would allow you determine the length and width of the pen. Indicate what each of the variables of the system represents.



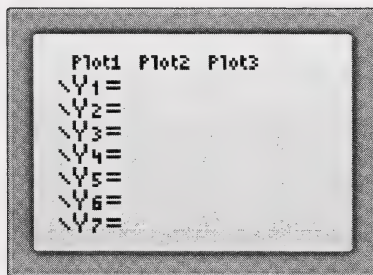
9. An airplane cruises at 120 km/h in still air. One day, when the wind was blowing steady from the west, the airplane travelled west (flying into the wind) and landed at its destination after 1.5 h. The airplane's return trip (flying with the wind) was only 1.0 h long. On both legs, the airplane travelled at its cruising speed (measured with respect to the air surrounding the airplane).

②

- a. Write a system of equations that would allow you to determine the speed of the wind blowing that day and the distance travelled each way.

①

- b. When solving the system of equations graphically, what equations would you enter into the equation editor? Fill in the blank calculator display.



①

- c. Indicate what the variable X and Y represent.

10. Solve the following systems of equations by substitution. Show your work.

①

a. $y = 2x + 10$

①

$y = 130$

②

①

b. $2a + 3b = 35$

①

$b = 10$

②

②

c. $3x + 5y = 12$

$x + 3y = 6$

①

②

11. Solve the following systems of equations by elimination. Show your work.

②

a. $3x + 4y = 25$

$2x - 11y = -38$

①

②

②

b. $6x + \frac{3}{2}y = 9$ ①

$2x + \frac{3}{2}y = 7$ ②

②

c. $3x - 5y = -21$ ①

$2x + 21y = 59$ ②

②

12. Solve the following system algebraically. Show your work.

$$\frac{3}{4}x - \frac{2}{5}y = 2 \quad \textcircled{1}$$

$$\frac{1}{2}x - \frac{3}{5}y = -2 \quad \textcircled{2}$$

- ② 13. Indicate which algebraic method—elimination or substitution—you think is easier to use when solving the following system of equations. Explain your answer. (You do not have to solve the system.)

$$3x - 7y = 10$$

①

$$7x + 2y = 5$$

②

14. It is possible that a system of equations may not have a solution.

- ② a. Explain how you can tell by inspection (rather than by trying to solve) that a system of two linear equations has no solution.

- ① b. Write a system of two linear equations having no solution.

15. A concert promoter set the following ticket prices for an event: \$8 for adults and \$5 for students. There were 1800 tickets sold for a total of \$12 750.

- ② a. Write a system of equations in two variables to model the situation.

②

b. Solve the system of equations.

①

c. Indicate the number of adult tickets and student tickets that were sold.

①

d. Check that your answer fits the situation.

